

On the 24th vessels in the northern steamer lanes experienced NW. winds of gale force. Storm logs:

British S. S. *Vardulia*:

Gale began on the 24th, wind SW. Lowest barometer 29.73 inches at 9 a. m. on the 24th, wind SW., 7, in latitude 50° 42' N., longitude 44° 38' W. End on the 25th, wind NW. Highest force 8; shifts SW.-NW.

British S. S. *Ilford*:

Gale began on the 24th, wind NW. Lowest barometer 29.59 inches at 8 a. m. on the 24th, wind NW., 8, in latitude 54° 45' N., longitude 21° 45' W. End on the 27th, wind NW. Highest force 8; shifts W.-NW.-N.-SW.

Charts VIII and IX show the conditions on August 25 and 26, respectively, when stormy weather prevailed over the eastern section of the steamer lanes. Storm logs:

British S. S. *Manchester Spinner*:

Gale began on the 24th, wind NW. Lowest barometer 30.02 inches at 3 a. m. on the 25th, wind NNW., 7, in latitude 48° 32' N., longitude 37° 39' W. End on the 25th, wind N. Highest force 7, steady NNW.

British S. S. *Belgian*:

Gale began on the 26th, wind NNW. Lowest barometer 30.04 inches at 10.16 a. m. on the 26th, wind NNW., 7, in latitude 49° 03' N., longitude 26° 04' W. End on the 26th, wind N. Highest force 7, steady NNW.

American S. S. *Bayon Chico*:

Gale began on the 26th, wind WSW. Lowest barometer 29.79 inches at 2 a. m. on the 27th, wind WNW., 9, in latitude 50° 25' N., longitude 16° 24' W. End on the 27th, wind N. Highest force 9; shifts WSW.-WNW.

In the afternoon of the 27th, while off the west coast of Cuba, the American S. S. *Hibueras* encountered a SE. wind, force 7, with rough sea, heavy SSE. swell, and frequent heavy rain squalls.

The observer on board the Danish S. S. *Dania* observed an unusually brilliant aurora borealis off the north coast of Scotland on the 27th, that was visible from 8 to 9:30 p. m. when fog shut in.

On the 28th and 29th stormy weather prevailed over the eastern section of the ocean north of the 40th parallel. Storm logs:

British S. S. *Rathlin Head*:

Gale began on the 29th, wind NW. Lowest barometer 29.77 inches at 4 p. m. on the 29th, wind NW., 7, in latitude 50° 23' N., longitude 24° 35' W. End on the 30th, wind NW. Highest force 8, NNW.; shifts NW.-NNW.

British S. S. *Norfolk Range*:

Gale began on the 28th, wind S. Lowest barometer 29.17 inches at 8:50 a. m. on the 29th, wind NW., 7, in latitude 46° 42' N., longitude 39° 26' W. End on the 30th, wind NW. Highest force 8, shifts S.-W.-NW.

Japanese S. S. *Choyo Maru*:

Gale began on the 30th, wind NW. Lowest barometer 29.74 inches at 6 a. m. on the 30th, wind N., 8, in latitude 47° 05' N., longitude 19° 40' W. End on the 30th, wind NNW. Highest force 8; steady N.

On the evening of the 31st the American S. S. *Coazet* encountered a sudden squall near latitude 42° N., longitude 43° W. Report follows:

9 to 10 p. m. August 31. Very heavy squall, thick, rain. Wind previously SSW., 6; light cumulus clouds from SSW. Squall came from W. (true) in arch formation similar to China Sea. Wind W., 8, backing to SW., 6 and clearing in an hour, then conditions as before.

NORTH PACIFIC OCEAN.

By WILLIS E. HURD.

The one occurrence of deep interest drawn from the records of the weather over the North Pacific Ocean

during August—one that will be remembered in history on account of the disaster it occasioned—was that of the so-called Swatow typhoon. This storm was first observed as a slight depression in the neighborhood of the Caroline Islands on the 27th of July. During the following four days the depression, gradually gaining in intensity, moved west-northwestward, until on the 31st it was over extreme northern Luzon, whence it took a more northerly turn and entered the Chinese coast at Swatow on the night of August 2-3. The enormous tidal wave accompanying the storm crossed the mud flats before the city and in conjunction with the hurricane wind caused a loss finally estimated at upwards of 50,000 lives out of a population of some 65,000 to the unfortunate city.

The following interesting narration concerning this storm was received by the Weather Bureau from the second officer, D. Lammers van Toorenburg, of the Dutch S. S. *Van Overstraten*:

PARTICULARS ABOUT THE TYPHOON OF JULY 31 TO AUGUST 3, 1922.

On the 31st of July a typhoon was signaled within 60 miles of 17° N. and 124° E. moving westward, while on the 1st of August the typhoon appeared to be within 60 miles of 18° N. and 122° E. moving WNW. S. S. *Van Overstraten* was laying at Hongkong, and being bound for Amoy, awaited on the 2d of August for the typhoon warning to be changed. The red cone (local warning No. 1) was up and at 10 a. m. the typhoon appeared to be at 22° N. 118° E. moving NW., while another report said that the center was about 23° N. and 117° 10' E., moving NW. and threatening Swatow. In the afternoon at about 2 p. m. the local signal No. 1 was lowered and S. S. *Van Overstraten* started on her voyage. As soon as the ship came outside the harbor we felt a heavy and long swell from the ESE., while the sea was smooth and the clouds were slowly working up from the south.

The wind was NW., force 4-5 (Sc. of Beauf.), and the barometer showed a heavy fall. At 12 noon the mercury barometer was 743.3; at 4 o'clock, 745.1. The barometer kept falling till about midnight, when the barograph showed a nearly vertical line. The wind had increased considerably and was gradually turning to the south. As this steady fall showed that the ship was moving towards the center of the typhoon and the sky had a most threatening aspect, the captain turned the ship on her trail and, heading westward, the barometer stopped falling and showed a slight inclination to rise. This was a good sign. The sea was very rough by this time and heavy rollers continually shook the ship in all her beams. The wind had increased to hurricane force, while the rain was pouring down, and heavy gales made matters worse. Anyhow, as the wind showed about 3 a. m. that the center was passed, we returned to the old course, east. In the morning, between 3 and 10 a. m., the rain was heaviest and big seas made it impossible to keep to the course. So the ship heaved to, and it was not until about 9 a. m. that the course east could be followed again. Though the rain kept falling during the whole morning and afternoon, the weather cleared up considerably and also the sea diminished. Around the whole horizon a thick veil of rain had settled, and it was impossible to get any bearings, which condition caused uneasiness. Arrived that night at Amoy, where it was stated that the weather had been very bad the last 36 hours.

The next day we heard that the typhoon was north of Canton City and apparently filling up.

The S. S. *Astuba Maru* wired that she met the typhoon at 22° 5' N. and 115° 26' E. moving WNW. This is about the same position we were in at that time, and the above wire should be considered to be a little too rash, as we only struck the outside of the lower semicircle. The typhoon barometer showed the ship to be in the vicinity of about 60 miles.

On arriving at Hongkong we heard that big damage was done to Swatow and about 5,000 people perished.

A preliminary report of the typhoon¹ has been forwarded by Capt. G. St. M. Stocker, of the pilot station on Double Island, in the Han River, a short distance below Swatow, which itself is but 5 miles from the river's mouth. He says:

August 2. Cloudy and threatening with variable light airs till 2:30 p. m. (local time), then moderate to strong NE. breeze, increasing

¹ A further account of this storm may be found elsewhere in this issue of the REVIEW.

until by 10 p. m. full gale from the north, and by 11 p. m. hurricane from the north, fierce squalls. No apparent change in direction till midnight, when wind backed slowly to NNW., force 11-12, and by 1:30 a. m. was NW. A tidal wave, rising about 8 feet above H. W. O. S. swept in from south, subsiding at about 2:15 a. m. From 1:30 to 2 a. m. on 3d a lull occurred, wind veering rapidly through NE. to SE., force 4-7, and at 2:30 a. m. came away from south with cyclonic force, lasting till about 5 a. m., and then blowing from SSE., force 4-6, all day.

Capt. Stocker also observed:

Heavy swell apparent on Swatow bar from evening of August 1, rapidly increasing. About 6:45 p. m. to 7:10 p. m., on August 2, entire atmosphere, but not sky, most distinct yellow tinge, observed and commented on by all residents of island, while sky continued gloomy and lowering, with masses of fracto-nimbus all over.

He also remarked that a more detailed account of the typhoon is under preparation.

The American S. S. *Nanking*, Capt. A. T. Dobson, Shanghai to Hongkong, encountered the outer winds of this typhoon during the 2d and 3d. While the storm center was about at the southern entrance to the Formosa Channel, the *Nanking* on the 2d was keeping well at the northern entrance, with first an ENE. wind, force 7, at 2 a. m., followed at 2 p. m. by a gale, force 9, from the east. This had worked into E. by S., force 9, at 4 p. m. At 5 p. m., in about latitude 25° 40' N., longitude 121° E., the ship's barometer recorded the lowest pressure, 29.20 inches (corrected). During the southward passage of the channel the vessel encountered mostly S. to SE. winds, and with slowly rising barometer passed Swatow shortly in the rear of the storm center.

The Japanese Weather Report for the week ended August 5 indicates that scarcely had this disturbance ceased to be felt at sea than another was discovered approaching the Loochoo Islands from the eastward. This formed on the 3d near 26° N., 135° E., and on the 6th entered the coast near 30° N. Nothing is known of the storm's severity beyond the fact that it gave rains and strong gales over the Loochoos.

On the 9th of the month a third tropical disturbance originated apparently near the southeastern extremity of Taiwan, moving northeastward. Near 25° N., 126° E., it began to recurve and on the 12th or 13th hit the coast near the 30th parallel, as had its predecessor. On this date the Canadian S. S. *Canadian Prospector*, Capt. Charles Wallace, Vancouver to Shanghai, was hit by the northern edge of the storm, and experienced ENE. to ESE. gales, force 8 to 10, in 31° 05' N., 122° 10' E. Her lowest recorded pressure was 29.38 inches at 8 p. m. The observer, Second Officer Mr. J. Addison, wrote:

August 12. Received typhoon warnings from Shanghai that pilot boat would not be able to proceed to sea that day.

August 13. Typhoon swept the China coast. Required to heave to for two days at entrance to Yangtse Kiang.

August 14. Weather cleared and pilot boarded.

Wireless advices of the same storm were received early on the 10th by the Dutch S. S. *Arakan* when near 28° N., 124° 37' E.: "Typhoon 23° N., 128° E., direction NW." Since the highest force of wind noted by this vessel was 7 from ESE., the observer, P. Bubberman, concluded truly that the "typhoon had passed at a great distance behind us."

At least two other tropical storms, of little known intensity at this writing, are known to have occurred in Far Eastern waters during August.² One originated near Guam on the 11th and moved northward, passing near the Bonin Islands about the 13th. Its entire course

was well out at sea, and it apparently became an extra-tropical storm, disappearing, or losing its identity, to the northward of the Aleutian Islands. The other originated on or near the 19th in the Marianas, and after pursuing a north-northwesterly course, crossed Japan near the 35th parallel on the 23d and entered the mainland south of Vladivostock a day or two later. The American S. S. *Nanking* experienced moderate to fresh gales from the southward and westward sides of this storm on the 23d and 24th. Her lowest recorded pressure was 29.12 inches at 8 p. m. of the 23d, while in latitude 30° N., longitude 135° 15' E.

For the month, as a whole, pressure conditions over the eastern part of the ocean were devoid of any unusual features. At Dutch Harbor, where pressure had been considerably above normal during the last three weeks of July, it fell to below normal at the beginning of August and continued so generally until the last week, when there was a change to above normal conditions. The average of the p. m. readings was 29.83 inches, or some 0.05 inch below normal. The highest reading, 30.16, occurred on the 17th and the lowest, 29.22, on the 23d. The normal pressure at Dutch Harbor falls sharply during August, being approximately 29.97 at the beginning of the month and 29.80 at the end.

At Midway Island p. m. pressure averaged 30.04 inches, or about 0.02 inch below normal. The highest reading, 30.14, occurred on the 7th; the lowest, 29.84, on the 26th. At Honolulu pressure averaged slightly above normal, the plus departure being about 0.02 inch. The highest reading, 30.08, occurred on the 1st; the lowest, 29.95, on the 25th.

The eastern half of the Pacific, by comparison with the western, was calm, indeed. The great North Pacific high-pressure area was persistent over a huge area throughout the month, and was crossed by no depressions. The Aleutian low-pressure area was well developed, and that, or offshoots from it, further covered part or all of the Gulf of Alaska from the 8th to the 14th; the 17th and 18th; and the 29th-30th. On the 28th high pressure came in over the upper reaches of Bering Sea, and spreading southward and eastward, gradually dominated the entire Aleutian area, so that on the 31st the center of the Gulf of Alaska low-pressure area of the preceding date had moved far into the Canadian Northwest.

In Mexican waters few gales were reported. However, the rainy season did not progress throughout the month with entire quiet. On the afternoon of the 27th what was apparently a cordonazo, or hurricane of this region, was encountered by the American S. S. *Henry D. Whiton*, Capt. Rene Blaustein, Observer Robert W. Smith, in latitude 15° 43' N., longitude 100° 30' W. At 6:30 p. m. the wind was ESE., force 11, with a barometric pressure of 29.31 inches (uncorrected). At 7 p. m. the wind went into SE., force 10, pressure rising rapidly, and wind thence diminishing from SE. The duration of the gale winds was about five hours.

Waterspouts were observed on two days in these waters. The American S. S. *Minnesotan* saw one at 4:50 p. m. of the 18th in 18° 52' N., 104° 30' W., and the second was noted on the 19th by the French S. S. *Alaska*, moving ENE. in 15° 46' N., 98° 26' W. The weather was reported as thundery in both instances.

Much fog was recorded over the northern steamship routes. To the west of the 180th meridian, "dense fog" and "continuous fog banks" occurred from the 5th to the 17th; and east of the meridian reports indicate a considerable occurrence of the phenomenon from the 4th to the end of the month.

² See article by Rev. José Coronas, S. J., elsewhere in this issue.

THE SWATOW TYPHOON OF AUGUST, 1922.

The Weather Bureau has received the following letter and report concerning the disastrous typhoon at Swatow in August of this year from Capt. G. St. M. Stocker, of the Swatow Pilotage Association. Captain Stocker has been acting as cooperative observer, and the location of his station near the mouth of the Han River enabled him to furnish an invaluable series of observations, but only made under the most trying conditions. Additional remarks by Captain Stocker will be found elsewhere.¹

AUGUST 29, 1922.

To the CHIEF OF THE UNITED STATES WEATHER BUREAU,
Department of Agriculture, Washington, D. C.

SIR: Please receive herewith a copy of a barograph record taken from my instrument at Double Island, at the entrance to the port of Swatow, in the first week of this month.

Such observations as I was enabled to take prior to and during the storm have been compiled in the form of notes, and I send you these also in the hope that they may prove of some service to you.

You will appreciate the fact that in such a heavy storm, attended as this was by enormous destruction of life and property, it is exceedingly difficult for an observer (whose house is crumbling away piecemeal all around him) to take accurate observations of the true direction of the wind, but I was able to record the barometer regularly and accurately, so these readings may be accepted as fairly correct.

People in Swatow, only 4 miles west of me, agree that they experienced a period of calm, whereas I and others here only experienced a lull, commencing at about 1:45 a. m., the time of the minimum reading of the barometer, and lasting for some three-quarters of an hour, during which time the wind veered from north to south by way of east with varying force between 3 and 8, when, settling from south, it blew by 3:00 a. m. with force 12.

When all the data necessary have been received by you I would esteem it a favor if you would let me have a tracing of the track of this storm, showing various directions and forces of winds at various points simultaneously, with corresponding barometer readings.

I am, Sir, very truly yours,

G. ST. M. STOCKER.

REPORT ON THE SWATOW TYPHOON.

A storm, accompanied by a tidal wave, passed over Swatow and neighborhood on the 2d of August, 1922, devastating a large part of the Han River delta and taking a heavy toll of life and property.

Apart from such telegraphic reports of the existence of a storm to the eastward of the Balintang Channel as came to hand, it was evident to observers on Double Island, at the entrance to the port of Swatow, as early as the evening of July 29 that a depression was moving toward the coast of China, the barometer being rather low and there being a pronounced swell on the bar.

By the morning of August 2 this swell had increased perceptibly, though there was but little wind. The sky was overcast and gloomy and the atmosphere oppressive, light showers falling occasionally.

Calms and variable light airs were experienced till noon, and then the wind came away from the northeast, force 4-6, with heavy showers. The swell on the bar became very heavy and the sea outside turbulent.

Just after sunset the whole sky and atmosphere assumed a dark yellow hue for about half an hour, which was commented on by many.

The barometer readings noted in this report are subject to a correction of +0.15 inch, the last comparison having been made on March 4, 5, 6, 1922. The time on the barograph record is one hour slower than local standard time, i. e., 120th meridian time. The readings recorded here are those of the aneroid, not the barograph.

By 8:00 p. m. on the evening of the 2d the aneroid read 29.20 inches, wind NE., force 6-8, sky Nimbus, 10.

After 8 o'clock the wind slowly backed to north, increasing in force to 10, and so continued till about 1:45 a. m. on August 3.

Shortly before 1 o'clock on the morning of August 3, it was noticed that the water was much higher than normal, and by 2 o'clock it had risen to a height of about 8 feet above normal high water.

From 11:00 p. m. to 1:00 a. m. the barometer dropped each half hour as follows: 0.13 inch, 0.15 inch, 0.35 inch, 0.45 inch. After that the drop was slower, being as follows: 0.15 inch, 0.10 inch, and by 1:45 a. m. it had reached its minimum of 27.55 inches.

After 1:45 a. m. the barometer rose rapidly, the wind veering from north to NE., force 3-6, and at 2:00 a. m. the barometer read 27.85 inches, the wind continuing to veer to the southward and increasing. At 2:30 a. m. the barometer read 28.10 inches, wind SE., force 5-8, and at 3:00 a. m. it read 28.60 inches, wind south, force 12.

The wind continued from the south with hurricane force till about 4:30 a. m., the barometer rising rapidly, until by 5:00 a. m. it had reached 29.40 inches, and the wind had dropped since 4:30 to force 5-7.

Both foreign and native shipping suffered heavily. Houses that escaped being blown down were washed away by the waters which spread over the whole country side, and the loss of life was enormous.

Owing to the general inundation, as well as to the extremely heavy rainfall which accompanied the storm, it was several days before the country became drained off, and meanwhile the tides appeared to lose their rise and fall, the surface current flowing to seaward nearly all the time, and the general level remaining above normal.

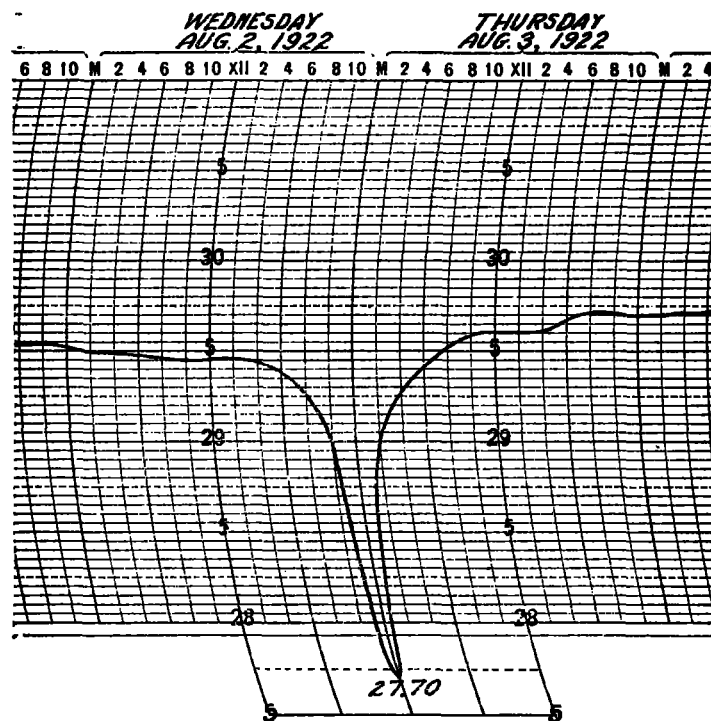


Fig. 1. Copy of barograph trace, extended, during passage of Swatow typhoon. Office Swatow Pilotage Association, Double Island, about 4 miles below city.

TEN DEPRESSIONS OR TYPHOONS IN THE FAR EAST DURING THE MONTH OF AUGUST, 1922.

By REV. JOSÉ CORONAS, S. J.

(Weather Bureau, Manila, P. I.)

August has been a very stormy month for the Far East. There have been at least five well-developed typhoons, while lack of observations makes it impossible for the present to decide whether the other five atmospheric disturbances shown in our Weather Maps were also, at least for some time, real typical typhoons, or only depressions of less importance.

The Swatow typhoon.—This will go down to history as one of the worst, if not the worst typhoon, that has ever visited the Far East. Our weather map of 2 p. m., July 29, showed clearly this typhoon as situated over 300 miles to the east of central Luzon, although observations from Guam and Yap seem to point out as the probable and approximate origin of the typhoon 138° longitude E. and 14° latitude N. on July 27.

The position of the center at 6 a. m. of July 30 to August 2 was as follows:

July 30, 6 a. m., 128° 25' longitude E. 16° 00' latitude N.
July 31, 6 a. m., 125° 40' longitude E. 16° 50' latitude N.
August 1, 6 a. m., 122° 45' longitude E. 18° 25' latitude N.
August 2, 6 a. m., 119° 30' longitude E. 21° 05' latitude N.

¹ See article, North Pacific Ocean.